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ABSTRACT

This study was designed to assess the relative effectiveness of four components of pretraining on a subsequent simultaneous discrimination and reversal: (1) making same-different judgments about the two stimuli; (2) making a specific observing response to the critical feature of the stimuli; (3) simple familiarization with the stimuli; and (4) developing a set to compare stimuli. Seventy-two first-grade children served as Ss. Two sets of stimuli were used: line drawings of cats and line drawings of children's faces. Although none of the pretraining conditions had a facilitating effect for Ss seeing the faces, there were significant facilitative effects for Ss seeing cats. Specifically, the three pretraining conditions involving same-different judgments facilitated both learning and reversal, whereas the effect of "observing response alone" pretraining had no such facilitative effect. (Author)

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The relative effectiveness of observing response vs predifferentiation pretraining on children's discrimination learning*

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This study was designed to assess the relative effectiveness of four components of pretraining on a subsequent simultaneous discriminaton and reversal: (1) making same-different judgments about the two stimuli; (2) making a specific observing response to the critical feature of the stimuli; (3) simple familiarization with the stimui; and (4) developing a set to compare stimuli. Seventy-two first-grade children served as Ss. Two sets of stimuli were used: line drawings of cats and line drawings of children's faces. Although none of the pretraining conditions had a facilitating effect for Ss seeing the faces, there were significant facilitative effects for Ss seeing cats. Specifically, the three pretraining conditions involving same-different judgments facilitated both learning and reversal, whereas the effect of "observing response alone" pretraining had no such facilitative effect.

A considerable amount of recent experimental research has focused on the effects of pretraining on children's subsequent discrimination and reversal learning. Working within a perceptual learning framework, the Gibsons (1955) initially demonstrated that having young children make same-different judgments of complex stimuli resulted in increased differentiation of those stimuli. In line with the Gibsons' results, Tighe & Tighe (1968) found that same-different pretraining facilitated reversal learning (but not original learning). Their stimuli were easily discriminable stimuli varying on two dimensions. They argued that these same-different judgments were comparisons which forced the child to detect the distinctive features (dimensions) of the stimuli. An implication of Gibson's recent theory (1969), which is made most explicit by "attention" theorists, is that pretraining involving specific observing responses to distinctive features should also facilitate subsequent discrimination learning. Our experimental conditions were specifically designed to test the relative effectiveness of same-different judgment pretraining, observing-response pretraining, and the two combined. In addition, we included groups designed to assess nonspecific transfer effects, simple familiarization effects, and a baseline control group that received no pretraining.

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METHOD

The Ss were 72 first-graders (mean age: 6 years 8 months), 32 boys and 40 girls, all of whom were average or above in intelligence.

The apparatus was a portable stimulus and response console, at the front of which were centered two 6-in.-diam Plexiglas windows. Each window was divided into three equal wedge segments. When the lower segment was touched during pretraining, a bulb lighted behind that segment. For conditions involving an

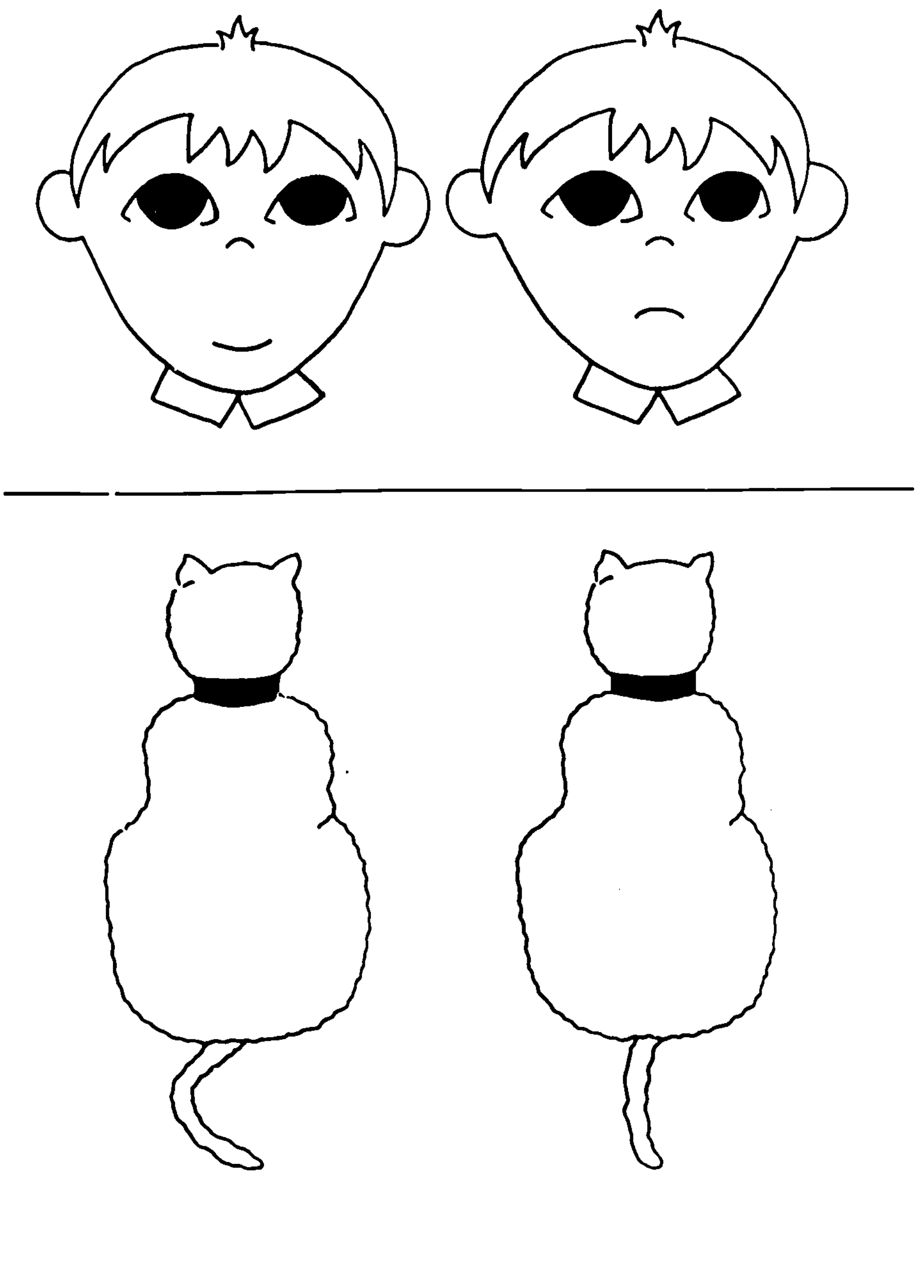

Fig. 1. Examples of cat and face stimuli used.

Table 1
Mean Trials to Criterion for Original and Reversal Learning

Condition	Original Learning						Reversal Learning					
	Cats			Faces			Cats			Faces		
	N	$\overline{X}$	SD	N	$\overline{X}$	SD	N	$\overline{X}$	SD	N	$\overline{X}$	SD
E-1	6	21.0	21.9	6	24.5	19.9	4	14.0	30.1	4	16.8	19.4
E-2	6	28.8	21.9	6	28.5	17.2	3	14.3	8.0	4	14.8	20.4
E-3	6	13.6	17.7	6	22.0	18.6	5	3.8	6.7	5	19.0	17.3
E-4	6	41.5	15.3	6	34.6	17.8	2	32.0	23.4	3	34.0	22.0
E-5	6	39.3	17.1	6	28.5	22.3	2	50.0	0.0	3	14.3	10.2
C	6	50.0	0.0	6	22.6	21.0	0	—	—	4	16.8	19.7

observing response at the beginning of each pretraining trial, the lower segment of one of the windows was darkened; for all other pretraining conditions, all segments were lighted at the beginning of each pretraining trial. During the discrimination proper, all segments of both windows were lighted at the beginning of each trial. Two sets of stimuli were used. One set consisted of four line drawings of faces. Two of these four faces were exactly the same and had a mouth which curved upward in a smile. The remaining two face drawings had mouths curved downward, creating a frown. The two frowning-face drawings were exactly alike. Smiling and sad faces were identical except for the mouths. A second stimulus set consisted of four line drawings of cats. Two of the cat drawings were exactly alike and had tails only slightly curved. The remaining two cat drawings were exactly the same but had more severely curved tails. All cat stimuli were exactly the same except for the type of tail. The distinguishing feature of each stimulus (mouth or tail) fit entirely within the bottom segment of the console window. Stimuli are shown in Fig. 1.

All children were tested individually. After a demonstration of how the machine worked, instructions appropriate to the child's pretraining condition were given, followed by the 16 pretraining trials (on 8 of these trials the stimuli were identical and on 8 they were different). No feedback was given on the pretraining trials.

The five experimental pretraining conditions were as follows:

In Condition E-1, the child was required to make an observing response at the beginning of each pretraining trial by pressing the darkened segment on one of the windows, thus lighting the critical or distinctive feature. The child was then asked to tell whether the pictures were the same or different. Instructions for PT Condition 1 were: "You are going to see a picture come on in each window. However, one picture will be partly covered by a dark spot so that you won't be able to see all of it. If you push on the dark part, though, it will light up and you will be able to see the whole picture. Every time the pictures come on I want you to light up the dark spot. Then look at both pictures very carefully and tell me whether they are the same or different." It was predicted that this condition, which combines observing responses and same-different judgments on the same stimuli as would later be discriminated would yield maximum positive transfer.

In Condition E-2, the same procedure was followed. However, stimuli seen in pretraining were not the same as those seen in the discrimination learning task. (Half the children saw faces in pretraining and cats in discrimination learning; the other half saw cats in pretraining and faces in discrimination learning.) This condition served as a control for nonspecific transfer effects. Instructions for Ss in PT Condition 2 were the same as those for Ss in Condition 1.

In Condition E-3, the stimuli appeared fully lighted and the child simply made same-different judgments. Instructions for children in PT Condition 3 were: "You are going to see a picture come on in each window. Every time the pictures come on, I want you to look at them very carefully and tell me whether they are the same or different."

In Condition E-4, the child was only required to make the observing response. Instructions were the same as those for Ss in Conditions 1 and 2, except that the phrase "and tell me whether they are the same or different" was eliminated.

In Condition E-5, both stimuli appeared and remained lighted for 7 sec. Instructions for Ss in this condition were: "You are going to see a picture come on in each window. Each time the pictures come on I want you to look at them very carefully." This condition served as a stimulus familiarization control.

Children in the control group (C) received no pretraining at all. The design was thus a 6 (conditions) by 2 (stimulus set) factorial with six Ss per cell.

Following pretraining, all children were then given instructions for the simultaneous two-choice discrimination problem and given up to 50 discrimination trials. For half the Ss, stimuli were the two differing face drawings (smiling and sad face). Stimuli for the other half of the Ss were the two differing cat drawings (a cat with a nearly straight tail and a cat with a curved tail).

The S was told that one of the two pictures would always be correct and that when he touched the correct picture he would get a marble. He was told to try to find out which picture was correct so that he could get a marble every time and win a prize.

When the child reached criterion (seven consecutive correct responses), he was given up to 50 trials on a simple reversal problem without further instructions (S+ became S−, and vice versa).

RESULTS AND DISCUSSION

Thirth-three of the 72 children tested did not learn the discrimination task to criterion and were assigned the maximum score of 50 trials. Of the 39 learners, 10 failed to reach criterion on the reversal task and were assigned a score of 50 trials on this measure.

The means and standard deviations for all Ss on both original learning and reversal are presented in Table 1. Inspection of the data indicated that, whereas there were minimal differences between conditions for Ss seeing faces, there were marked effects for Ss who saw cats during discrimination learning. In addition, there was a significant overall difference between Ss for whom the smiling face was S+ ($\overline{X}$ = 20.77) and Ss for whom the frowning face was S+ ($\overline{X}$ = 32.77; $t = 1.80$, one-tailed; $df = 34$; $p < .05$), whereas there was no significant difference between Ss for whom the straight-tailed cat was S+ ($\overline{X}$ = 31.72) and Ss for whom the curved-tailed cat was S+ ($\overline{X}$ = 32.06; $t < 1$). Thus, one-way analyses were performed separately for children seeing each stimulus set. For children seeing faces, the effect of conditions was not significant ($F < 1$).

However, a significant conditions effect was found for children who viewed the cats ($F = 3.11$, $df = 5/30$,

p < .05). Means for the six conditions were compared via Duncan's multiple range test. Ss in E-1 learned the discrimination significantly faster than Ss in C and marginally faster than Ss in E-4; Ss in E-3 learned the discrimination faster than Ss in E-4, E-5, and C. Ss in E-2 learned the discrimination faster than Ss in C, but this difference was only marginally significant.

Separate one-way analyses of variance for unequal and disproportionate frequencies were also performed on trials to reversal criterion. For children who saw the faces, as in discrimination learning, the effect of conditions was not significant ($F < 1$). Since no child in C who saw cats learned the original discrimination, the analysis of variance included only five groups. The effect of conditions was again significant ($F = 3.56$, $df = 4/13$, $p < .05$), and means for the five conditions were compared via Duncan's multiple range test. As with the data on original learning, there were no significant differences among the performance of children in conditions where a same-different judgment was required (E-1, E-2, E-3). However, all three of these conditions produced significantly faster reversal learning than did E-5. In addition, Ss in E-3 learned the reversal problem faster than Ss in E-4, but this difference was only marginally significant. Thus, the three pretraining conditions which facilitated both discrimination and reversal learning, relative to the no-pretraining control, all involved the child's making same-different judgments, either alone or in conjunction with the specific observing response.

The data seem to indicate that same-different pretraining works in two ways. First, it forces the child to examine the stimuli and detect the specific differences between them that will be critical in solving the subsequent discrimination. This would explain the facilitation found in conditions involving same-different judgments on the same stimuli, as were later seen in the discrimination learning task (E-1 and E-3). Second, same-different pretraining creates a set to compare and search out distinctive features in general, independent of the *specific* stimuli examined. This second process could explain the facilitation obtained in the transfer group (E-2). The fact that the three conditions involving same-different pretraining did not differ among themselves suggests that "set" to compare is perhaps the critical aspect of the same-different pretraining procedure.

Contrary to expectation, pretraining involving merely making observing responses (E-4) did not facilitate either discrimination or reversal learning. Nor did addition of the observing response component to same-different judgments (E-1) create additional facilitation to that already obtained with same-different judgments alone (E-3). In fact, since children making only same-different judgments during pretraining learned somewhat faster than children who made both same-different judgments and observing responses, the observing response may have had a detrimental effect. That our observing response failed to facilitate learning was most probably due to the mechanics of the response itself. In pretraining, the observing response consisted of the child's pushing the dark segment of one of the two stimuli, thus illuminating that segment. The child may merely have watched for the light to come on and thus ignored the feature in that segment. Furthermore, since the window in which the dark segment appeared varied randomly from trial to trial, random position responses could have been reinforced by the light onset—a type of stimulus-change reinforcement. (An observing response procedure in which both windows contained a darkened segment on all trials might eliminate this problem.)

The failure to find significant condition effects when stimuli were faces requires explanation. As mentioned above, children for whom the smiling face was correct learned the problem significantly faster than did children for whom the frowning face was correct. This is clearly a confounding factor and may have overshadowed differences among the pretraining conditions.

In conclusion, our data suggest that given affectively neutral stimuli, making same-different judgments creates a set to compare distinctive features, both general and specific. This set then transfers positively to discrimination learning and reversal.

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